REMARKS

Favorable reconsideration is respectfully requested.

The claims are 1 to 24 with claims 1 to 14 and 19 to 23 being withdrawn from consideration. Thus, the claims under examination are 15 to 18 and 24.

New claim 24 has been added by the above amendment and support is evident from the disclosure on page 26, lines 27 to 29.

The above amendment is responsive to points set forth in the Official Action as will be discussed below.

With regard to the restriction requirement in Official Action paragraphs 1 to 5, applicants hereby affirm the election of Group II containing claims 15 to 18. It is believed that new claim 24 is properly examinable with claims 15 to 18.

Claims 15 to 18 have been rejected as indefinite in that claim 15 recites the limitation "the metallic-treatment layer surface" in line 2 and such that limitation lacks sufficient antecedent basis. In reply, antecedent basis has been provided by the above amendment. Further, it is now recited that the metallic-treatment layer contains nickel as an essential element, as recited in original claim 2.

Claim 15 has also been amended to recite that the energy of the irradiation is substantially the same from beginning to end, to make a hole and support is evident from page 26, lines 24 to 27 of the present specification.

On the other hand, new claim 24 recites that the energy of the irradiation increases from the beginning to the end of the irradiation. Support is evident from page 26, lines 27 to 29 for this feature.

Claims 15-18 have been rejected under 35 U.S.C. 102(e) as being anticipated by Gaku et al. (US 6,280,641).

Further, claims 15-16 and 18 have been rejected under 35 U.S.C. 102(b) as being anticipated by Inagawa et al. (US 5,073,687).

Lastly, claim 17 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al. (US 5,073,687) as applied to claims 15-16 and 18 above, and further in view of Origuchi (JP 411087931 A).

These rejections are respectfully traversed.

The rejection states that as to claim 15-16, Gaku et al. (US 6,280,641) disclose a process for making a hole in a copper-clad board or printed circuit board by irradiation with a carbon dioxide gas laser beam having an energy sufficient to make the hole by means of the pulse oscillation of the laser beam, wherein the energy of the carbon dioxide gas laser is 20-60 mJ (as for claim 16, see Official Action paragraph 10).

As to claim 15, the rejection states that Inagawa et al. (US 5,073,687) disclose a process for making a hole in a copper-clad board or printed circuit board by irradiating a laser beam having an energy sufficient to make the hole by means of the pulse oscillation of the laser beam, wherein the laser beam is from a carbon dioxide gas laser (see Official Action paragraph 11).

In reply, Gaku et al., and Inagawa et al. do not disclose or suggest that the copper-clad board has a metallic-treatment layer surface, wherein the layer contains nickel as an essential component.

The copper foil having a metallic-treatment layer, which layer contains nickel as essential component, has a high absorption rate of a carbon dioxide gas laser energy and allows a hole to be made by directly irradiating the surface of the copper foil with a carbon dioxide gas laser. When the double-sided copper foil having the metallic-treatment layer and a thermosetting resin layer are laminate-formed under heat and pressure, an alloy of the metal of the metallic-treatment layer and the copper is formed. The above alloy has characteristic properties wherein the alloy is not peeled off by surface-friction in some degree. The above alloy layer makes it easy to make a penetration hole and/or a via hole with a carbon dioxide gas laser.

Inagawa et al. state that according to their experiments, a laser beam of 10 mJ per pulse was irradiated at an oscillation period of 100 Hz (col.7, lines 50-52).

However, as described in Comparative Example 1 on page 35 of the present specification, when electrolytic copper foils having a thickness of 9 μm were used, holes could not be made in

the copper-clad board with a carbon dioxide gas laser at an output of 12 mJ, since the laser beam was reflected, so that the energy of the carbon dioxide gas laser was not absorbed.

Inagawa et al. disclose that the high output laser beams R1 and R4 of the initial oscillation and the final oscillation need high power to form holes in the copper foil portions of the front and back surfaces. The low output laser beams R2 and R3 of the intermediate oscillation are used to form a hole in the resin portion.

On the contrary, in the present invention, when the hole e.g. penetration hole and/or the blind via hole is made, there may be employed a method in which the same energy is irradiated from beginning to end (page 26, lines 24-27).

When making holes in accordance with the method disclosed in Inagawa et al., holes can be made when using copper foils having a thickness of 3 μm or less in applicant's experiments.

However, in the present invention, holes can be made when using 9 μm thick copper foil having metallic-treatment of the present invention as described in Example 1.

There is nothing Origuchi, which overcomes the above-discussed deficiencies of Inagawa et al.

For the foregoing reasons, the rejections on prior art are untenable and should be withdrawn.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact undersigned at the telephone number below.

Respectfully submitted,

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Version with Markings to Show Changes Made

15. (Amended) A method of making a hole in a copper-clad board, in which [the] a surface of the metallic-treatment layer [surface] of the copper-clad board recited in claim 1, which layer contains nickel as an essential element, is directly irradiated with a carbon dioxide gas laser having an energy sufficient for processing a copper foil by means of the pulse oscillation of the carbon dioxide gas laser, and said carbon dioxide gas laser having substantially the same energy of irradiation from beginning to end, to make said hole [to make a penetration hole and/or a blind via hole].